

CLAIMS

What is claimed is:

1 1. A method of providing transparent local area network (LAN)
2 service in a ring network, comprising:

3 allocating respective proportions of data transmission
4 capacity of the ring to different closed user groups (CUGs), each
5 closed user group including a corresponding plurality of LAN
6 clients of the transparent LAN service; and

7 at each of a plurality of network devices attached to the
8 ring:

9 (1) monitoring the use of a connected segment of the
10 ring for both pass-through and locally-generated traffic by
11 the LAN clients on a per-CUG basis; and

12 (2) upon detecting that use of the connected segment
13 for a given CUG is approaching the proportion of ring data
14 transmission capacity allocated to the CUG, selecting an
15 active one of the LAN clients of the CUG and sending a
16 throttle message to the selected LAN client, the throttle
17 message indicating that the LAN client is to reduce its data
18 transmission rate.

1 2. A method according to claim 1, wherein the monitoring for each
2 CUG comprises:

3 maintaining a set of buffers for traffic of the CUG and
4 removing traffic from the buffers at a predetermined aggregate
5 rate corresponding to the proportion of ring data transmission
6 capacity allocated to the CUG; and

7 continually determining whether the occupancy of the buffers
8 exceeds a predetermined threshold.

1 3. A method according to claim 1, wherein the selecting for each
2 CUG comprises:

3 maintaining a rate cache identifying active sending ones of
4 the LAN clients of the CUG and corresponding rates at which the
5 active LAN clients are sending traffic; and

6 selecting from among the active LAN clients identified in
7 the rate cache according to a predetermined selection criteria.

1 4. A method according to claim 3, wherein the predetermined
2 selection criteria includes successively rotating among the
3 identified active LAN clients.

5 5. A method according to claim 1, wherein the CUGs are first-type
6 CUGs receiving guaranteed delivery service, and further
7 comprising, at each of the plurality of network devices:

8 monitoring the fullness of a set of buffers for traffic of
9 second-type CUGs receiving best-effort service; and

10 upon detecting that the fullness of the buffers exceeds a
11 predetermined threshold, selecting an active one of the LAN
12 clients of one of the second-type CUGs and sending a throttle
13 message to the selected LAN client, the throttle message
14 indicating that the LAN client is to reduce its data transmission
15 rate.

1 6. A method according to claim 1, wherein the throttle message
2 comprises a pause message, and wherein the selected LAN client
3 responds to the pause message by temporarily ceasing its data
4 transmission.

1 7. A method according to claim 1, wherein the throttle message
2 indicating that the selected LAN client is to reduce its
3 transmission rate by a predetermined amount specified by the
4 throttle message.

1 8. A network providing transparent local area network (LAN)
2 service, the network comprising a plurality of nodes
3 interconnected in a ring, the ring having an overall data
4 transmission capacity divided into respective proportions
5 allocated to different closed user groups (CUGs), each closed user
6 group including a corresponding plurality of LAN clients of the
7 transparent LAN service, each of the nodes being operative to
8 (1) monitor the use of a connected segment of the ring for both
9 pass-through and locally-generated traffic by the LAN clients on a
10 per-CUG basis, and (2) upon detecting that use of the connected
11 segment for a given CUG is approaching the proportion of ring data
12 transmission capacity allocated to the CUG, select an active one
13 of the LAN clients of the CUG and sending a throttle message to
14 the selected LAN client, the throttle message indicating that the
15 LAN client is to reduce its data transmission rate.

1 9. A network according to claim 8, wherein each node includes a
2 plurality of sets of buffers, each set used to buffer the traffic
3 of a corresponding one of the CUGs, and is further operative when
4 monitoring segment use for each CUG to: (1) remove traffic from
5 the buffers of the CUG at a predetermined aggregate rate
6 corresponding to the proportion of ring data transmission capacity
7 allocated to the CUG, and (2) continually determine whether the
8 occupancy of the buffers exceeds a predetermined threshold.

1 10. A network according to claim 8, wherein each node includes a
2 plurality of rate caches, each rate cache identifying active
3 sending ones of the LAN clients of a corresponding CUG and
4 corresponding rates at which the active LAN clients are sending
5 traffic, and wherein the node is operative when selecting a LAN
6 client for receiving a throttle message to select from among the

7 active LAN clients identified in the rate cache according to a
8 predetermined selection criteria.

1 11. A network according to claim 10, wherein the predetermined
2 selection criteria includes successively rotating among the
3 identified active LAN clients.

1 12. A network according to claim 8, wherein the CUGs are
2 first-type CUGs receiving guaranteed delivery service, and wherein
3 each of the nodes is further operative to (1) monitor the fullness
4 of a set of buffers for traffic of second-type CUGs receiving
5 best-effort service, and (2) upon detecting that the fullness of
6 the buffers exceeds a predetermined threshold, select an active
7 one of the LAN clients of one of the second-type CUGs and send a
8 throttle message to the selected LAN client, the throttle message
9 indicating that the LAN client is to reduce its data transmission
10 rate.

11 13. A network according to claim 8, wherein the throttle message
12 comprises a pause message, and wherein the selected LAN client
13 responds to the pause message by temporarily ceasing its data
14 transmission.

1 14. A method according to claim 8, wherein the throttle message
2 indicating that the selected LAN client is to reduce its
3 transmission rate by a predetermined amount specified by the
4 throttle message.